

proof of the variability of the earth. Thus more than 250 earthquakes were recorded in the United States alone during 1953.

During the IGY three fields relating to the earth's crust and interior will be studied: Studies of seismology, which is concerned with earthquakes and similar events, will be conducted in remote regions. Measurements of gravity, the pull of the earth, will be made in areas where observations are now lacking—particularly in the Antarctic and certain parts of the oceans. Determinations of latitude and longitude will be made at selected points, using both conventional astronomical techniques and a new photographic technique involving the moon.

#### SEISMOLOGY

Although man seems helpless where such physical events as earthquakes are concerned, actually he can lessen the damage done by such disasters by improving his knowledge of their nature, by finding out how likely they are to occur in particular locations, and by determining how extensive they may be.

Earthquakes are caused by "faults" deep within the crust of the earth. These giant cracks are left over from the prehistoric days when mountains were thrown up and great canyons formed in the bottom of the oceans. The faults are scars which have not yet healed completely, flaws under the surface where the earth has not yet settled down. In 1940, for example, the San Andreas Fault in California stirred and settled a bit and shifted the United States-Mexican border almost 10 feet. Thirty-four years earlier the same fault produced the San Francisco earthquake of 1906, with a death toll of 700 and property damage of \$400 million.

Earthquakes in the depths of the oceans sometimes cause huge tidal waves, or seismic sea waves. Advance warning of the tidal wave which hit the Hawaiian Islands in 1946 would have saved many of the 170 lives lost and decreased the property damage, which amounted to \$25 million.

Microseisms, the much smaller tremors of the earth's crust, result from physical occurrences nearer the surface of the earth. The energy from atmospheric disturbances joins with that of the earth's surface, usually through oceanic waters, to jar the earth with a series of small shocks, which are recorded as background vibrations on such instruments as seismographs. Man can cause minor earth shocks, large enough to be recorded by seismographs, by means of explosives.

Earthquake waves and explosion waves provide information about the thickness and layering of the surface of the earth. In addition, seismographs can record the thickness of ice in such a place as the Antarctic, thereby giving scientists knowledge of the actual profile of the continent under the ice. Seismologists study earthquakes to determine their mode of formation, their exact locations, and the energy released. This, they expect, will enable them to develop prediction methods for times of occurrence and location. They hope also to increase their knowledge of the structure of the earth, its crust, its outer and inner shells, and its core; and they want to learn more about microseisms.

Seismological studies have long been conducted on an internationally cooperative basis. The IGY gives scientists the opportunity to make additional measurements in remote areas, particularly at Antarctica